## CLAIM AMENDMENTS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A motion estimation method for estimating a motion vector between a reference image frame and a current image frame, each of said reference frame and said current frame being formed by a plurality of pixels, the method comprising the steps of:

(a1) dividing a reference frame into a plurality of reference macroblocks, each of the plurality of reference macroblocks comprising a plurality of adjacent pixels within said reference frame, a set of said reference macroblocks forming a search range;

(a2) dividing at least one current frame into at least one current macroblock comprising a plurality of continuous pixels from said current frame, each of said reference macroblocks and said at least one current macroblock having generally a same size and shape with a corresponding pixel distribution;

(a3) determining a similarity of one of said reference macroblocks and a selected one of said at least one current macroblock based on calculated pixel units in said selected current macroblock and one of said reference macroblocks, wherein one calculated pixel unit ~~comprises~~ is an average of two adjacent pixels[[;]],

determining the similarity by:

multiplying each calculated pixel unit in said current macroblock with a corresponding calculated pixel unit in one of said reference macroblocks resulting in a plurality of multiplying values; and

summing each of the plurality of multiplying values for each of the calculated pixel units in said selected current macroblock;

(a4) repeating step (a3) for all of said reference macroblocks in said search range; and

(a5) determining a motion estimation of said current frame and said reference frame based on said respectively determined similarity in steps (a3) and (a4).

2. – 6. (Cancelled).

7. (Currently Amended) The method of claim [[6]] 1 further comprising determining a motion estimation vector between said selected current macroblock and one of said reference macroblocks within said search range having a larger sum of said multiplying values than a sum of said multiplying values between said selected current macroblock and each other of said reference macroblocks within said search range.

8. (Currently Amended) A motion estimation method for estimating a motion vector between a reference image frame and a current image frame, each of said reference frame and said current frame being formed by a plurality of pixels, the method comprising the steps of:

(b1) dividing a reference frame into a plurality of reference macroblocks, each of the plurality of reference macroblocks comprising a plurality of adjacent pixels within said reference frame, a set of said plurality of reference macroblocks forming a search range;

(b2) dividing a current reference frame into a current macroblock comprising a plurality of continuous pixels from said current frame, each of said reference macroblocks and said current macroblock having generally a same size and shape with a corresponding pixel distribution;

(b3) determining a similarity of one of said reference macroblocks and said current macroblock based on calculated pixel units in said current macroblock and a first determined set of said reference macroblocks, wherein one calculated pixel unit ~~comprises~~ is an average of two adjacent pixels[[;]], determining the similarity by:

multiplying each calculated pixel unit in said current macroblock and a corresponding calculated pixel unit in one of said reference macroblocks resulting in a plurality of multiplying values; and

summing each of the plurality of multiplying values for each of the calculated pixel units of said current macroblock;

(b4) determining similarities for said first predetermined set of reference macroblocks in said search range for performing a coarse tune operation;

(b5) determining a preferred reference macroblock from said first predetermined reference macroblocks based on said similarities;

(b6) determining similarities for a second predetermined set of reference macroblocks around said preferred reference macroblock based on calculated pixel units of said current macroblock and said second predetermined set of reference macroblocks for performing a fine tune operation; and

(b7) determining a motion estimation of said current frame and said reference frame from said determined similarities of step (b6).

9. – 17. (Cancelled).

18. (Currently Amended) The method of claim [[17]] 8, further comprising determining a motion estimation vector between said current macroblock and one of said reference macroblocks within said first predetermined set of said reference macroblocks having a larger sum of said calculated multiplying values than a sum of said multiplying values between said selected current macroblock and each other of said reference macroblocks within said first predetermined set of said reference macroblocks.

19. (Previously Presented) The method of claim 8 further comprising the steps of:

calculating a multiplying value of a pixel of said current macroblock and a corresponding pixel of one of said reference macroblocks resulting in a plurality of calculated multiplying values; and

summing said calculated multiplying values for all pixels of said current macroblock.

20. (Previously Presented) The method of claim 19, further comprising the step of determining a motion estimation vector between said current macroblock and one of said reference macroblocks within said second predetermined set of said reference macroblocks having a smaller sum of said calculated multiplying values than a sum of said multiplying values between said selected current macroblock and each other of said reference macroblocks within said second predetermined set of said reference macroblocks.

21. (Original) The method of claim 1 wherein said reference frame and said current frame are formed by even lines and odd lines.

22. (Previously Presented) The method of claim 21 further comprising determining a top field motion estimation using pixels in said even lines.

23. (Previously Presented) The method of claim 21 further comprising determining a bottom field motion estimation using pixels in said odd lines.

24. (Original) The method of claim 8 wherein said reference frame and said current frame are formed by even lines and odd lines.

25. (Previously Presented) The method of claim 24 further comprising determining a top field motion estimation using pixels in said even lines.

26. (Previously Presented) The method of claim 24 further comprising determining a bottom field motion estimation using pixels in said odd lines.

27. (Currently Amended) A motion estimation device comprising:

a memory having a frame buffer to store a plurality of image frame data;

a controller coupled to said memory, said controller including logic to receive and process data of a current image frame and a reference image frame, and to output processed data;

a first motion estimation processor responsive to said controller for coarse-tuning motion estimation of said current image frame to said reference image frame based on said processed data from said controller, the first motion estimation processor to determine a similarity of a reference macroblock and a current macroblock associated with an image from the plurality of image frame data, wherein the reference macroblock and the current macroblock each comprise multiple pixels, the first motion estimation processor to determine the similarity based on calculated pixel units in the current macroblock and a first determined set of calculated pixel units of the reference macroblock, the first motion estimation processor to output ~~coarsed-tuned~~ coarse-tuned data, wherein one calculated pixel unit ~~comprises~~ is an average of two adjacent pixels; and

a second motion estimation processor responsive to said controller and said first motion estimation processor for fine-tuning motion estimation of said current frame to said reference frame based on said processed data from said controller and said coarse-tuned data from said first motion estimation processor[[.]];

wherein said controller sends a difference between every calculated pixel unit of each of said reference macroblocks and a corresponding calculated pixel unit of said current macroblock and a least significant bit of a sum of every calculated pixel unit of each of said reference macroblocks and the corresponding calculated pixel unit of said current macroblock to said second motion estimation processor.

28. (Previously Presented) The device of claim 27 wherein:

said controller divides a plurality of reference macroblocks, each comprising a plurality of continuous pixels within said reference frame;

said reference macroblocks form a search range; and

said controller divides a current macroblock comprising a second plurality of continuous pixels from said current frame;

wherein each of said reference macroblocks and said current macroblock has approximately a same size and approximately a same shape, with a corresponding pixel distribution.

29. (Cancelled).

30. (Original) The device of claim 28 wherein said second motion estimation processor determines a similarity of said reference macroblocks and said current macroblock based on every pixel in said reference macroblocks and said current macroblock.

31. (Cancelled).

32. (Previously Presented) The device of claim 27 wherein shapes of said reference macroblocks and said current macroblock are approximately rectangular.

33. (Original) The device of claim 27 wherein said memory further comprises a dynamic random access memory (DRAM) and static dynamic random access memory (SDRAM).

34. (Currently Amended) A motion estimation method comprising the steps of:

(a) displaying an image in a plurality of frames corresponding to a plurality of time periods; wherein each frame further comprises a given number of pixels, each pixel represented by two-dimensional abscissa and ordinate coordinates;

wherein each frame further comprises at least one macroblock having a lesser number of pixels than said given number of pixels of said frame;

wherein a current frame is one of said frames in a current time period of said plurality of time periods;

wherein said current frame further comprises at least one current macroblock having a lesser number of pixels than said given number of pixels of said current frame;

wherein a reference frame is one of said frames in a time period of said plurality of time periods prior to said current time period for said current frame;

wherein said reference frame further comprises at least one reference macroblock having a lesser number of pixels than said given number of pixels of said reference frame;

(b) determining calculated pixel units of said current macroblock, wherein one calculated pixel unit ~~comprises~~ is an average of two adjacent pixels;

(c) repeating step (b) for all pixels of said current macroblock;

(d) determining calculated pixel units of one macroblock of said reference macroblocks;

(e) repeating step (d) for all pixels of said one reference macroblock;

(f) ~~subtracting~~ multiplying each calculated pixel unit of said current macroblock ~~from~~ by a corresponding calculated pixel unit of said one reference macroblock resulting in a plurality of ~~differences~~ multiplying values;

~~(g) taking a plurality of absolute values for said differences resulting in a plurality of absolute values;~~

(h) summing ~~said absolute~~ the plurality of multiplying values resulting in a ~~SAD (sum of absolute values of differences)~~ sum of correlations (SC);

(i) shifting abscissa and ordinate coordinates of said one reference macroblock by corresponding abscissa and ordinate shift values resulting in a shifted reference macroblock;

(j) determining calculated pixel units of said shifted reference macroblock;

(k) repeating step (j) for all pixels of said shifted reference macroblock;

(l) ~~subtracting~~ multiplying each calculated pixel unit of said current macroblock ~~from~~ by a corresponding calculated pixel unit of said shifted reference macroblock resulting in an additional plurality of ~~differences~~ multiplying values;

~~(m) determining an additional plurality of absolute values for said additional differences resulting in an additional plurality of absolute values;~~

(n) summing said additional plurality of ~~absolute~~ multiplying values resulting in an additional ~~SAD~~ SC;

(o) repeating steps (i), (j), (k), (l), (m) and (n) for each reference macroblock resulting in a plurality of additional ~~SADs~~ SCs; and

(p) selecting a selected ~~SAD~~ SC from a group comprising the ~~SAD~~ SC and said additional ~~SADs~~ SCs, wherein the selected ~~SAD~~ SC has a ~~smaller~~ larger value than another of the group.

35. (Cancelled).

36. (Original) The method of claim 34 wherein said reference frame and said current frame are formed by even lines and odd lines.

37. (Previously Presented) The method of claim 36 further comprising determining a top field motion estimation using pixels in said even lines.

38. (Previously Presented) The method of claim 36 further comprising determining a bottom field motion estimation using pixels in said odd lines.